PATENT CLAIMS

1. A method for cutting of items, such as food products, into portions of predetermined size, said method comprising the steps of

- placing the items on conveying means;
- transporting the items to measuring means and from the measuring means to cutting means on the conveying means;
- measuring at least one characteristic of each item with the measuring means;
- sectioning the items by the cutting means;
- controlling and regulating at least one cutting process parameter in order to achieve predetermined product portions based on the measured item characteristic;

characterised in that

said items are placed consecutively and essentially abutting each other on said conveying means.

2. A method according to claim 1, whereby the controlling step comprises item boundary detection, wherein the point of transition between consecutive items on the conveyor means based on said at least one measured item characteristic.

3. A method according to claim 2, whereby the item boundary detection includes receiving successive item data sets from the at least one measured item characteristic; and analysing the received data for identifying the boundaries between the consecutively abutting items.

4. A method according to claim 3, whereby the item boundary detection includes

- receiving successive item data sets from the at least one measured item characteristic,

- calculating the summary differences between two successive data set being the sum of the differences between a first data set and a second data set, and
- identifying the calculated summary differences exceeding a predetermined threshold, said identified summary differences representing a location of one point of transition between two items.

5. A method according to claim 4, whereby the controlling step comprises the summary difference between two data sets, comprising distance data from one or more sensors in the measuring means, are obtained by

$$\Sigma\Delta = |\Delta 1| + |\Delta 2| + |\Delta 3| + \ldots + |\Delta n| ,$$

where $\Sigma\Delta$ is the summary difference, $\Delta 1$ is the difference between a first distance data and a successive second distance data from the first sensor in the measuring means, and 'n' is the number of sensors.

6. A method according to claim 4, whereby the controlling step comprises the summary difference between two data sets, comprising distance data from one or more sensors in the measuring means, are obtained by

$$\Sigma\Delta = |\Delta 1/a| + |\Delta 2/a| + |\Delta 3/a| + \ldots + |\Delta n/a| ,$$

where $\Sigma\Delta$ is the summary difference, $\Delta 1$ is the difference between a first distance data and a successive second distance data from the first sensor in the measuring means, 'n' is the number of sensors and 'a' is the length between the location of the first set of distance data and the location of the second set of distance data.

7. A method according to any of the preceding claims, whereby the measuring means is a scanning device, preferably a ring scanner.

8. A method according to any of claims 1 to 4, whereby the measuring means include a scanning device, wherein at least one light source is arranged to emit at least one line of light towards the item and the reflected light is detected by sensor means

arranged at an angle, typically approx. 30° between the emitted and the reflected light beams.

9. A method according to claim 8, whereby the emitted at least one light line is oriented substantially parallel to the transporting direction of the items.

10. A method according to claim 8, whereby the emitted at least one light line is oriented across the conveyor.

11. A method according to any of claims 8 to 10, whereby the controlling step includes organising the measurements for defining at least one list of item characteristics representing a line characteristics along the items on the conveyor and calculating the summary difference between two data sets in said list, said summary difference being obtained by

$$\Sigma\Delta = |\Delta 1| + |\Delta 2| + |\Delta 3| + \ldots + |\Delta n| ,$$

where $\Sigma\Delta$ is the summary difference, $\Delta 1$ is the difference between a first data set and a successive second data set in the item characteristics, and 'n' is the number of data sets.

12. A method according to any of claims 8 to 10, whereby the controlling step includes organising the measurements for defining at least one list of item characteristics representing a line characteristics along the items on the conveyor and calculating the summary difference between two data sets in said list, said summary difference being obtained by

$$\Sigma\Delta = |\Delta 1/a| + |\Delta 2/a| + |\Delta 3/a| + \ldots + |\Delta n/a| ,$$

where $\Sigma\Delta$ is the summary difference, $\Delta 1$ is the difference between a first data set and a successive second data set in the item characteristics, 'n' is the number of data sets, and 'a' is the length between the location of the first data set and the location of the second data set.

13. A method according to any of claims 8 to 12, whereby the at least one measured item characteristic is the height of the items.

14. A method according to any of the preceding claims, whereby the items are aligned with the longitudinal direction of the abutting items.

15. A method according to any of the claims 1 to 13, whereby the items are mutually displaced relative to the longitudinal direction of the abutting items.

16. A method according to any of the preceding claims, whereby the conveying means is a V-shaped conveyor.

17. A method according to any of the preceding claims, whereby the method includes weighing the items before the measuring.

18. A method according to any of the preceding claims, whereby a transition marker between items is inserted.

19. A method according to any of the preceding claims, whereby the measuring means include detecting in surface colour and/or texture and identifying changes therein.

20. An apparatus for portion cutting of items, such as food products, said apparatus comprising

conveying means for transporting items placed on said conveying means to measuring means for detecting at least one characteristic of the product, and onwards to cutting means for sectioning the items into portions,

control means for controlling and regulating at least one cutting process parameter in order to achieve predetermined item portions based on the measured item characteristics,

characterised in that

said items are placed consecutively and essentially abutting each other on said conveying means.

21. An apparatus according to claim 20, wherein the control means include item boundary detection means for determining the point of transition between two items based on said at least one measured item characteristic.

22. An apparatus according to claim 21, wherein the item boundary detection means include receiving successive item data sets from the at least one measured item characteristic; and analysing the received data for identifying the boundaries between the consecutively abutting items.

23. An apparatus according to claim 22, wherein the control means include item boundary detection means, wherein

- successive product data sets are provided from the at least one detected item characteristic,
- the summary differences between two successive data set are calculated as being the sum of the differences between a first data set and a second data set, and
- at least one point of transition between two items is located by identifying the calculated summary differences exceeding a predetermined threshold.

24. An apparatus according to claim 23, wherein the control means are provided with the summary difference between two data sets, comprising distance data from one or more sensors in the measuring means by

$$\Sigma\Delta = |\Delta 1| + |\Delta 2| + |\Delta 3| + \ldots + |\Delta n| ,$$

where $\Sigma\Delta$ is the summary difference, $\Delta 1$ is the difference between a first distance data and a successive second distance data from sensor 1 in the measuring means, and 'n' is the number of sensors.

25. An apparatus according to claim 23, wherein the control means are provided with the summary difference between two data sets, comprising distance data from one more sensors in the measuring means by

$$\Sigma\Delta = |\Delta 1/a| + |\Delta 2/a| + |\Delta 3/a| + .. + |\Delta n/a| ,$$

where $\Sigma\Delta$ is the summary difference, $\Delta 1$ is the difference between a first distance data and a successive second distance data from a first sensor in the measuring means, 'n' is the number of sensors and 'a' is the length between the location of the first set of distance data and the location of the second set of distance data.

26. An apparatus according to any of the claims 20 to 25, wherein the measuring means is a scanning device, such as ring scanner, measuring surface dimensions, colour and/or textures, such as exterior and/or interior characteristics.

27. An apparatus to any of claims 20 to 22, whereby the measuring means include a scanning device, wherein at least one light source is arranged to emit at least one line of light towards the item and the reflected light is detected by sensor means arranged at an angle, typically approx. 30° between the emitted and the sensor position.

28. An apparatus according to claim 27, whereby the emitted at least one light line is oriented parallel to the transporting direction of the items.

29. An apparatus according to claim 27, whereby the emitted at least one light line is oriented across the conveyor.

30. An apparatus according to any of claims 27 to 29, wherein the control means include means for organising the measurements for defining at least one list of item characteristics representing a line characteristics along the items on the conveyor and calculating the summary difference between two data sets in said list, said summary difference being obtained by

$$\Sigma\Delta = |\Delta 1| + |\Delta 2| + |\Delta 3| + ... + |\Delta n| ,$$

where $\Sigma\Delta$ is the summary difference, $\Delta 1$ is the difference between a first data set and a successive second data set in the item characteristics and 'n' is the number of data sets.

31. An apparatus according to any of claims 27 to 29, wherein the control means include means for organising the measurements for defining at least one list of item characteristics representing a line characteristics along the items on the conveyor and calculating the summary difference between two data sets in said list, said summary difference being obtained by

$$\Sigma\Delta = |\Delta 1/a| + |\Delta 2/a| + |\Delta 3/a| + \ldots + |\Delta n/a| ,$$

where $\Sigma\Delta$ is the summary difference, $\Delta 1$ is the difference between a first data set and a successive second data set in the item characteristics, 'n' is the number of data sets, and 'a' is the length between the location of the first data set and the location of the second data set.

32. An apparatus according to claim 20 to 31, where the conveying means is a V-shaped conveyor.

33. An apparatus according to any of the claims 20 to 32, wherein the apparatus includes weighing means for weighing the products.

34. An apparatus according to any of the claims 20 to 33, wherein the apparatus includes means for inserting a transition marker between the items.